State of California
THE RESOURCES AGENCY
Department of Fish and Game

Biennial Report to the Legislature

Regarding Bighorn Sheep Management

December 2010

Submitted in compliance with Fish and Game Code Section 4904

INTRODUCTION

This report was prepared pursuant to Section 4904 of the Fish and Game Code, and is the most recent in a series of biennial reports to the Legislature summarizing activities and information related to bighorn sheep management. Through legislation enacted in 1986, it was declared to be the policy of the State to encourage the preservation, restoration, utilization, and management of California's bighorn sheep population in accordance with Section 1801 of the Fish and Game Code. In addition, the Fish and Game Commission was authorized to adopt all necessary regulations to provide for biologically sound management of Nelson bighorn sheep, including sport hunting of rams. However, sport hunting regulations shall not authorize hunting in a single year of more than 15 percent of the estimated mature Nelson bighorn rams in the management units.

The results for the period 2009 – 2010 are presented in this report as required by law. Requisite elements of this report include: status of unit management plans; summary of bighorn sheep counts in specified units; numbers of hunting license tags issued; summary of unlawful take of bighorn sheep; number of bighorn sheep translocated; and environmental impacts of hunting bighorn sheep.

The California Department of Fish and Game's (CDFG) Bighorn Sheep Conservation Program maintains an inventory of the distribution of bighorn sheep in California. This assessment of bighorn sheep populations is conducted as part of a long-term management strategy for bighorn sheep in California. We have grouped the populations of bighorn sheep in California into metapopulations, or regional systems of subpopulations, that represent the most logical geographic areas for managing for the long-term viability of this species. This approach recognizes the importance of intermountain areas that allow movement and exchange of individuals among populations, the recolonization of vacant habitats, and the interagency coordination of land management activities. Our definition of regional populations considers not only vegetative and geographic boundaries, but also man-made barriers such as freeways that define distributions, and that have resulted in the fragmentation of bighorn sheep habitat.

Although a metapopulation approach is an important biological principle for management and long-term survival of bighorn sheep populations, it is equally important as a management concept that emphasizes the importance of the regional coordination of bighorn sheep population and habitat management. Several investigations have emphasized the importance of population size and genetic diversity to the long-term survival of bighorn sheep populations. Although population size is important, the number of populations, the maintenance of genetic diversity, and the ability to recolonize vacant areas are equally important aspects of metapopulation function.

Ten metapopulations of bighorn sheep have been defined within California; distributed among these were 3 subspecies defined by early scientists, but recent taxonomic revisions indicate that only two subspecies occur in California. The majority of bighorn sheep in the state currently are recognized as belonging to the Nelson subspecies (*Ovis canadensis nelsoni*), and inhabit the Sonoran Desert, the Mojave Desert, portions of the Great Basin Desert, and the transverse ranges of Ventura, Los Angeles, and San Bernardino counties. Sierra Nevada bighorn sheep (*O. c.*

sierrae) are restricted in distribution to the Sierra Nevada of eastern California. Bighorn sheep inhabiting the peninsular ranges of Riverside, San Diego, and Imperial counties (and designated as the peninsular metapopulation) have been classified as endangered by the Federal Government since 1998, and are classified as threatened by the State of California. Bighorn sheep comprising the Sierra Nevada metapopulation are listed as endangered by the State, and were classified as endangered by the Federal Government in 1999. All bighorn sheep are fully protected, although limited harvest occurs in selected areas as a result of state law that provides for the biologically sound management of bighorn sheep, including the sport hunting of mature male Nelson bighorn sheep.

Given the need to understand the status and dynamics of regional populations of bighorn sheep, we have categorized all known populations by the numbers of animals (size class) within each. The Department continues to utilize historical and current data from ground, waterhole, and aerial surveys to categorize these populations. Although population estimates vary in precision, we believe the size classes are adequate to provide an accurate and conservative assessment of each population.

Our defined metapopulations are summarized by size classes, and population estimates are subsequently computed by totaling the median interval estimates. At the close of 2010, we estimate that there are about 5,200 bighorn sheep distributed across 61 mountain ranges in California. Of these, the metapopulations of Nelson bighorn sheep total approximately 4,800 individuals and, based on the most recent information available (June 2009), the Sierra Nevada metapopulation was estimated to number nearly 400 individuals. A survey conducted by CDFG in 1972 resulted in a statewide estimate of 3,737 bighorn sheep; a similar estimate in 2003 was about 4,500 bighorn sheep. These data indicate that the total number of bighorn sheep in California has increased over the past 40 years. Although the overall statewide trend has been upward, conditions vary among local populations. Declining local populations have been, and will continue to be, a high priority for research and management programs.

Nelson Bighorn Sheep

Nelson bighorn sheep numbers continue to remain stable, but continue to fluctuate around long-term means. In general, populations of bighorn sheep in the Mojave Desert have been increasing slowly, but population dynamics are influenced strongly by the amount and timing of precipitation, which varies widely across southern and eastern California. Our helicopter surveys indicate that the recruitment of rates of lambs was quite variable in 2009 and 2010, reflecting the influences of localized rainfall as well as population density.

During 2009 and 2010, a rangewide survey of the peninsular ranges metapopulation was conducted and an analysis of those data resulted in an estimate of about 950 adult bighorn sheep and recruited lambs distributed among nine distinct subpopulations as of December 2010. Thus, the number of bighorn sheep inhabiting the Peninsular Ranges has been on an upward trend since the mid-1990s, and the population of bighorn sheep in the Peninsular Ranges currently approaches the highest previous estimate (1,070), which was reported in 1974. The U.S. Fish and Wildlife Service completed and published the recovery plan for bighorn sheep in the Peninsular Ranges in 2000.

Sierra Nevada Bighorn Sheep

Emergency action was taken in 1999 by the California Fish and Game Commission to uplist Sierra Nevada bighorn sheep from threatened to endangered, and the taxon received emergency listing as endangered in 1999 by the Federal Government, a classification that was formalized in 2000. These actions were in response to a substantial decline from an estimated 310 in 1985 to about 100 individuals in 1999, potentially the result of a combination of predation, severe winter weather, and accidental deaths. The U.S. Fish and Wildlife Service completed and published the recovery plan for Sierra Nevada bighorn sheep in 2007.

Sierra Nevada bighorn sheep are among the rarest and most endangered mammals in North America, and have been the object of an intensive recovery program directed by the California Department of Fish and Game since 2000. Elements of the recovery program include intensive population monitoring, reducing mortality, reestablishing additional populations in historic range, maintaining genetic diversity, and increasing population size. The most recent data available indicate that about 400 bighorn sheep currently inhabit the Sierra Nevada, and that the population is on an upward trend.

MANAGEMENT PLANS

Intensive data collection continued during this report period and provided basic information for preparing additional population management plans. These efforts addressed range conditions, population sizes, age class structure, and sex ratios, as well as sampling individual animals for the prevalence of diseases and parasites.

Pursuant to Section 4901 of the Fish and Game Code, management plans have been completed for a number of major herds of bighorn sheep in California. The CDFG Bighorn Sheep Management Program currently is preparing a rangewide management plan that will inventory and evaluate the population status of all bighorn sheep populations and subpopulations within the State, and establish an overall strategy to conserve bighorn sheep in California. This planning effort will identify and set priorities for management activities to ensure the long-term viability of bighorn sheep populations. Protection of important habitats and inter-mountain movement corridors, identification of future reintroduction sites, and the maintenance, improvement, and development of wildlife water developments will be addressed as part of the overall conservation strategy. Separate recovery plans have been prepared for bighorn sheep inhabiting the Peninsular Ranges and the Sierra Nevada, and are being implemented. During 2010, drafts of two regional management plans (Cady Mountains Management Unit and South Bristol Mountains Management Unit) were completed and have been submitted for final approval.

SUMMARY OF ANNUAL SURVEYS

During 2009, aerial surveys were conducted in the Marble Mountains, Clipper Mountains, Old Dad and Kelso Peaks, Clark, Kingston, and Mesquite mountains, Orocopia Mountains, San Gorgonio Wilderness, Sheephole Mountains, and White Mountains management units. Aerial surveys were conducted during both 2009 and 2010 in the Cady Mountains and South Bristol Mountains management units. Although results obtained during 2009 in the Cady Mountains and South Bristol Mountains are shown, only survey results from 2010 contributed to the total numbers presented in the following table. These results were used to establish the 2010 hunting tag allocations, and form the basis of preliminary tag allocations for the 2011 hunting season.

Mountain Range	Survey Date	Ewes	Lambs	Rams	Total
Marble Mountains	October 2009	88	34	65	187
Clipper Mountains	October 2009	13	4	16	33
Kelso Peak and Old Dad Peak	October 2009	95	15	69	179
Clark, Kingston, and Mesquite Mountains	October 2009	45	6	28	79
Orocopia Mountains	September 2009	39	7	21	67
Sheephole Mountains	May 2009	22	3	17	42
South Bristol Mountains	October 2009	44	13	26	83
South Bristol Mountains	October 2010	33	9	30	72
Cady Mountains	September 2009	92	37	38	167
Cady Mountains	October 2010	102	23	49	174
White Mountains	March 2009	59	16	31	106
San Gorgonio Wilderness	May 2009	48	15	20	83
TOTALS		544	132	346	1,022

These data represent minimum population sizes, since they involve only animals actually observed and classified; experience indicates that actual populations are much larger. Conservative population estimates (as derived from the above results and corrected for an average visibility bias of 0.80) for the Marble Mountains, Clipper Mountains, Kelso Peak and Old Dad Peak, Clark, Kingston, and Mesquite Mountains, Orocopia Mountains, Sheephole Mountains, South Bristol Mountains, Cady Mountains, White Mountains, and San Gorgonio Wilderness management units are 270, 50, 250, 110, 100, 60, 100, 250, 150, and 120 adults and recruited young, respectively.

NUMBER OF HUNTING TAGS

After 22 successful hunting seasons since 1987, a 23rd hunt was approved by the Fish and Game Commission in 2009, and a 24th hunt was approved in 2010. A total of 19 Nelson bighorn ram hunting tags were authorized for the season in 2009. Four tags were allocated in the Marble Mountains Management Unit, 6 tags were allocated in the Kelso Peak-Old Dad Peak Management Unit, 2 tags were allocated in the Clark-Kingston Mountains Management Unit, 1 tag was allocated in the Sheephole Mountains Management Unit, 3 tags were allocated in the White Mountains Management Unit, and 1 tag was allocated in the San Gorgonio Wilderness Management Unit. In addition, two fund-raising tags were valid in any open unit; each of these fund-raising tags was provided pursuant to Section 4902 of the Fish and Game Code. During the 2009 hunting season, hunters harvested a total of 19 mature rams, ranging from 5-11 years-of-age.

In 2010, a total of 22 Nelson bighorn ram hunting tags were authorized by the Fish and Game Commission. Four tags were allocated in the Marble Mountains Management Unit, 4 tags were allocated in the Kelso Peak/Old Dad Mountains Management Unit, 2 tags were allocated in the Clark/Kingston Mountains Management Unit, 1 tag was allocated in the Orocopia Mountains Management Unit, 2 tags were allocated in the Sheephole Mountains Management Unit, 4 tags

were allocated in the White Mountains Management Unit, and 2 tags were allocated in the San Gorgonio Wilderness Management Unit. Additionally, one fund-raising hunting license tag was valid in any open unit, a second fund-raising tag was valid in both the Marble-Clipper Mountains Management Unit and Sheephole Mountains Management Unit, and a third fund-raising tag was valid in only the Old Dad Peak-Kelso Peak Management Unit; each of these fund-raising tags was provided pursuant to Section 4902 of the Fish and Game Code. As of 31 December 2010, 15 of 22 hunters had been successful in taking mature rams ranging from 3 to 13 years-of-age. A total of 7 hunters will remain eligible to hunt until termination of the 2010 hunting season during February 2011.

The 2009 open-zone fundraising tag produced a high bid of $55,000, and the second fund-raising tag produced a high bid of $50,000; thus, a total of $105,000 was raised through the sale of these special tags. A total of 8,219 applications with a $ 7.50 non-refundable application fee were received for the drawing for 17 general tags, which were distributed by computerized random selection. Each of the 15 successful resident applicants paid an additional $ 357.50 hunting license tag fee. Total revenue generated from the sale of applications, permits, and special fund-raising tags for the 2009 hunting season was $ 173,378. As specified by law, this revenue was deposited in the bighorn sheep account and shall be used to augment, and not replace, existing funds available to the Department for the preservation, restoration, utilization, and management of bighorn sheep.

The 2010 the open zone fund-raising hunting license tag produced a high bid of $ 80,000, the second fund-raising tag produced a high bid of $ 60,000, and the third fund-raising tag produced a high bid of $ 50,000; thus, a total of $190,000 was raised through the sale of these special tags A total of 11417applications with a $7.50 non-refundable application fee were received for the drawing for 19 general tags, which were distributed by computerized random selection. Each of 18 successful resident applicants paid an additional $367.50 hunting license tag fee. One nonresident applicant was drawn in 2010, and that individual paid an additional $500 in hunting license tag fees. Total revenue generated from the sale of applications, permits, and special fund-raising tags, up to and including the 2010 hunting season, is approximately $3.6 million. As specified by law, this revenue was deposited in the bighorn sheep account and shall be used to augment, and not replace, existing funds available to the Department for the preservation, restoration, utilization, and management of bighorn sheep.

UNLAWFUL TAKING

California Department of Fish and Game Law Enforcement Division personnel reported 4 confirmed incidents involving the illegal killing of bighorn sheep during 2010; there were no known violations by hunters during either the 2009 or 2010 bighorn sheep hunt.

POPULATION RECOVERY AND REINTRODUCTION PROJECTS

The two primary management objectives of the Mountain Sheep Conservation Program are to (1) maintain, improve, and expand bighorn sheep habitat; and (2) re-establish bighorn sheep populations on historic ranges. Population reintroduction projects are a major activity used by management agencies to restore historic populations. Since 1983 the Department has captured and moved nearly 500 bighorn sheep from native ranges to restore or augment populations of *O. c. nelsoni* and *O. c. sierrae*. It is anticipated that bighorn sheep will be translocated within the

Sierra Nevada during the next report period (2011-2012), but at the present time no other plans for translocation have been formulated.

During 2009, 6 bighorn sheep were translocated within the Sierra Nevada to augment existing populations in that mountain range. As the result of an aerial accident that resulted in the tragic deaths of 4 individuals early in 2010, all scheduled translocations were cancelled; hence, no bighorn sheep were captured and moved in 2010. Nevertheless, detailed demographic assessments have continued, and ensure the recovery of bighorn sheep populations from which animals previously have been removed for translocation. Comprehensive long-term demographic studies are underway in populations throughout California, and have been designed to monitor and direct management activities.

During 2010, a very limited number of bighorn sheep were captured for research purposes. A total of only 10 individuals were captured, sampled, collared, and released, all of them in the peninsular ranges. Capture activities in 2010 were constrained substantially as the result of the helicopter accident. The following capture, sample, radio-collar, and release projects occurred in 2010:

Population	County	# Rams	# Ewes	Total
Santa Rosa Mountains	Riverside and San Diego	0	8	8
Vallecito Mountains	San Diego	1	1	2
Total		1	9	10

ASSESSMENT OF ENVIRONMENTAL IMPACT OF HUNTING ON NELSON BIGHORN SHEEP

A detailed discussion of the environmental impact of regulatory changes affecting the hunting Nelson bighorn sheep on the herds is contained in the Final Environmental Document regarding bighorn sheep hunting prepared by CDFG in 2005.

Bighorn sheep exist in approximately 61 populations (herds), with 5,200 individual animals estimated statewide. Nelson bighorn sheep occur in Mono, Inyo, San Bernardino, Riverside, Imperial, San Diego, Ventura, and Los Angeles counties. In 2010, a total of only 7 herds were hunted: the Marble Mountains, Kelso Peak/Old Dad Peak, Clark and Kingston ranges of San Bernardino and Inyo counties, Orocopia Mountains, Sheephole Mountains, San Gorgonio Wilderness (Riverside and San Bernardino counties), and the White Mountains (Mono County). Therefore, the remaining populations of bighorn sheep were not influenced by hunting activity. The potential harvest of 22 bighorn rams during the 2010 hunting season will represent less than 0.5 percent of the total number of bighorn sheep estimated to occur in California.

The proportion of legal rams in the Marble Mountains, Kelso Peak-Old Dad Peak, Clark-Kingston-Mesquite Mountains, Orocopia Mountains, Sheephole Mountains, White Mountains, and San Gorgonio Wilderness populations has been relatively stable from 1987 to present. This

indicates that the removal of the limited number of mature rams from the herds has no adverse impact on the age structures of the herds. The number of males removed has been too small to result in a measurable increase in lamb recruitment when compared to unhunted herds. Because the age structure is not impacted, the social structure of the herds is maintained. No impacts are expected in the future to adversely affect genetic variability or diversity due to changes in the social structure of the herds.